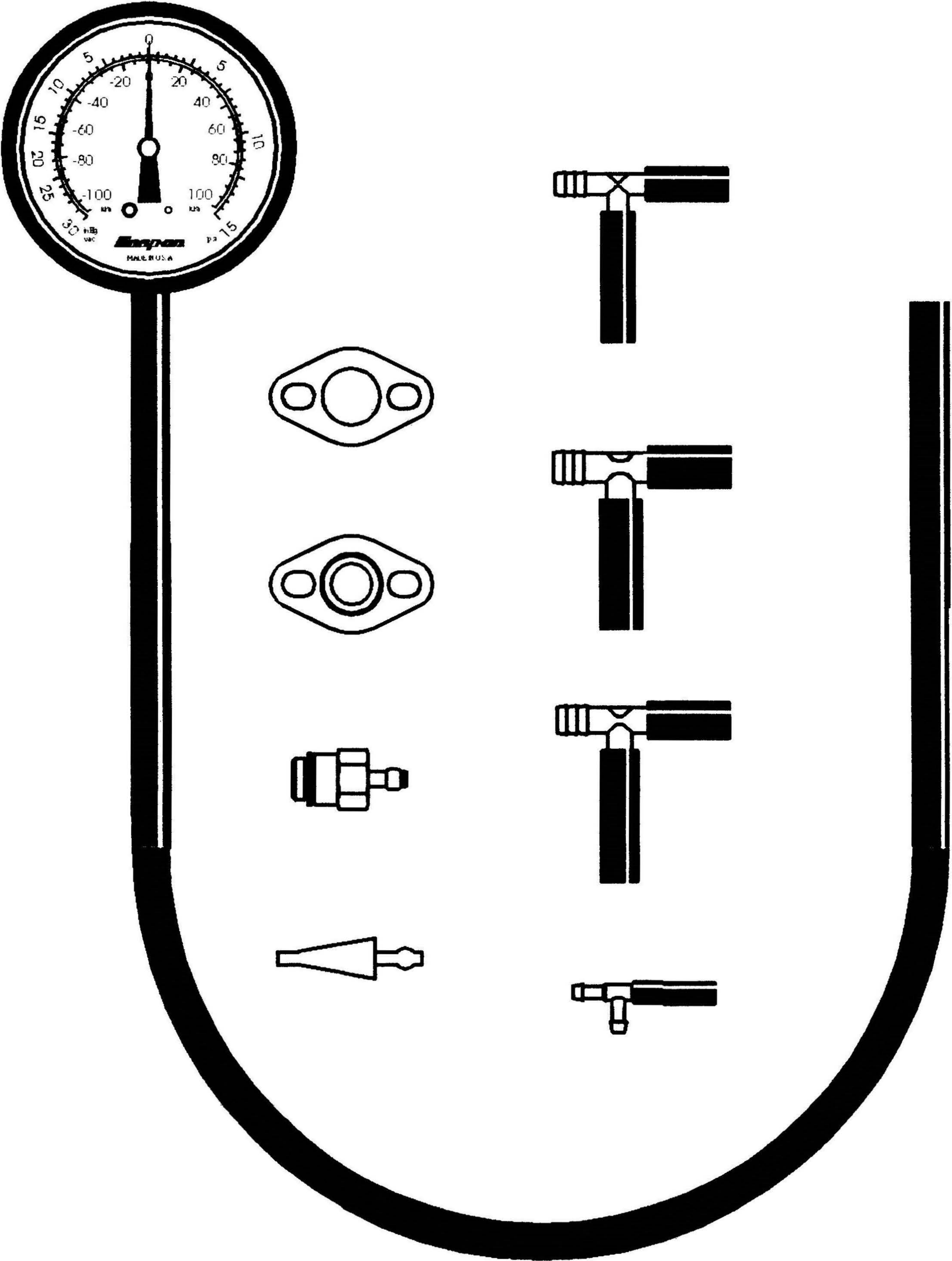


Snap-on

EEPV311A

Vacuum/Pressure Gauge Set



INSTRUCTION MANUAL

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Vacuum/Pressure Gauge Set

Safety Information

Important Safety Instructions

This manual contains important safety and operating instructions for the **Snap-on** Vacuum/Pressure Gauge Set. Refer to the information in this manual often for safe operation.

Read All Instructions

Read, understand and follow all safety messages and instructions in this manual and on the test equipment. Safety messages in this section of the manual contain a signal word, a three part message, and, in some instances, an icon. An icon, when present, gives a graphical description of the potential hazard.

⚠ DANGER

Risk of poisoning

- **Use this equipment in locations with mechanical ventilation providing at least four air changes per hour. Engine exhaust contains carbon monoxide gas, a colorless, odorless lethal gas.**
- **Route exhaust outside while testing with engine running.**

Poisoning can result in death or serious injury.

⚠ DANGER

Risk of explosion.

- **Wear safety goggles and protective clothing, user and bystander.**
- **Use tester in an area having at least four air changes per hour.**
- **Do not smoke, strike a match, place metal tools on the battery or cause a spark to occur in vicinity of the test.**
- **Make sure test equipment and adaptors are properly connected before proceeding with a test.**

Explosion can cause death or serious injury.

⚠ DANGER

Risk of fire.

- **Wear safety goggles and protective clothing, user and bystander.**
- **Never use water to fight flaming gasoline, methanol or methanol blended gasolenes, since water will spread, not put out the fire.**
- **Keep a functional fire extinguisher in the work area. Acceptable types are : CO₂, Halon, or dry chemical marked ABC or BC. If a foam type is used, it must be an ARF type which is resistant to alcohols.**

Fire can cause death or serious injury.



Risk of expelling fuel, oil vapors, hot steam, hot toxic exhaust gasses and other debris.

- **Wear safety goggles and protective clothing, user and bystander.**
- **Engine systems can malfunction expelling fuel, oil vapors, hot steam, exhaust gasses and other debris.**

Fuel vapors, hot steam, hot toxic exhaust gasses and other debris can cause serious injury.



Risk of burns.

- **Do not touch hot engine components.**
- **Tester adaptors and hoses can become hot after testing in close proximity to hot engine components. Wear gloves when handling hot components.**

Hot components can cause injury.

⚠ WARNING

Risk of unexpected vehicle movement.

- **Block drive wheels before performing a test with engine running.**
- **Unless instructed otherwise, set parking brake and put gear selector in neutral for standard transmission or park for automatic transmission.**
- **If vehicle has an automatic parking brake release, disconnect the release mechanism for testing and reconnect when testing is completed.**
- **Do not leave a running engine unattended.**

A moving vehicle can cause injury.



Risk of entanglement.

- Do not place test equipment or tools on fenders or other places in engine compartment.
- Keep yourself, clothing and tester hoses clear of moving parts, such as fan blades, pulleys, hood and doors.
- Barriers are recommended to help identify danger zones in test area.
- Prevent personnel from walking through immediate test area.

Contact with moving parts can cause injury.



Misdiagnosis may lead to incorrect or improper repair and/or adjustment.

- Do not rely on erratic, questionable or obviously erroneous test information or results. If test information or results are erratic, questionable or obviously erroneous, make sure that all connections are correct and that the test procedure was performed correctly. If test results are still suspicious, do not use them for diagnosis.

Contact your Snap-on representative.

Improper repair and/or adjustment may cause vehicle or equipment damage or unsafe operation.

SAVE THESE INSTRUCTIONS

Functional Description

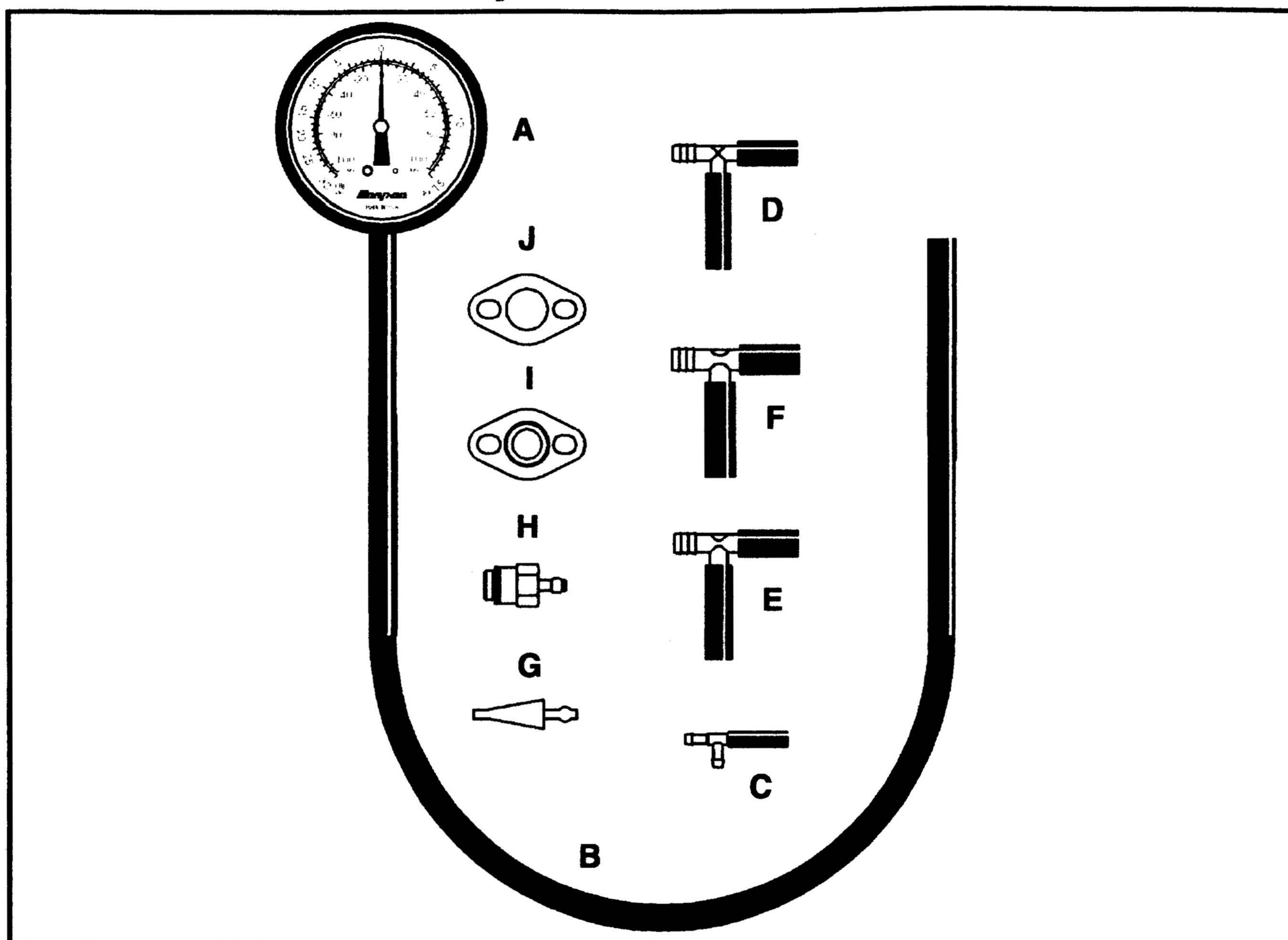


Figure 1; EEPV311A Vacuum/Pressure Gauge Set

- A - Gauge and Boot Assembly
- B - Silicon Hose (4 ft)
- C - 3/16 Adaptor
- D - 1/4 Adaptor
- E - 5/16 Adaptor
- F - 3/8 Adaptor
- G - Universal Male Adaptor
- H - Oxygen Sensor Adaptor M18-1.5
- I - Oxygen Sensor Adaptor Plate
- J - Oxygen Sensor Adaptor Gasket

The vacuum/pressure gauge is a versatile and valuable test instrument. It offers a quick and positive way to test an engine for malfunctions such as valve problems, faulty piston rings and intake system leaks. It can be used to check for excessive exhaust pressure and it can be used to test vacuum operated emission components and heating and air conditioning controls.

The gauge is divided into two sections - VACUUM on the upper half and PRESSURE on the lower half.

Vacuum is measured in inches of mercury (in. Hg.) on the red scale and kilopascals (kPa) on the blue scale. The red scale reads from 0 to 28 in. Hg. in increments of 1 in. Hg. and the blue scale reads from 0 to 96 kPa in increments of 2 kPa.

Pressure is measured in pounds per square inch (PSI) on the green scale and in kilopascals (kPa) on the blue scale. The green PSI scale reads from 0 to 15 PSI in increments of 1 PSI and the blue kPa scale reads from 0 to 110 kPa in increments of 5 kPa.

This set includes adaptors that enable connections to be made on most vacuum operated systems as well as an exhaust back pressure adaptor and heat resistant hose that fits most all oxygen sensor ports.

Optional adaptors are available for testing mechanical fuel pumps and diesel injector pump special tests.

Manifold Vacuum

The vacuum gauge indicates in inches of mercury (Hg). The difference between outside atmospheric pressure and the vacuum (negative pressure) present in the intake manifold. In the internal combustion engine, vacuum is created by the downward motion of a piston in a cylinder (or the rotation of a rotor in a rotary engine). This action draws air and fuel into the cylinder and is repeated as long as the engine is running.

The “normal” amount of intake manifold vacuum created will vary by engine type and design. In addition, vacuum readings are affected by altitude. For most engines, at sea level and at specified idle speed, the vacuum should be in the 14 to 22 in. Hg. range. To correct for altitude, reduce the vacuum specification 1 in. Hg. for every 1000 feet of elevation.

Comparing intake vacuum readings to vacuum specifications will provide valuable data for diagnosing the general condition of an engine. But the use of numerical values alone does not take full advantage of the vacuum gauges usefulness. Judgements of engine performance can be made more effectively by analyzing both the numerical value and by the amount and rate of fluctuation of the vacuum gauge indicator. The combination of this data will prove most helpful in diagnosing specific engine malfunctions, and is covered in more detail in TESTING and INTERPRETATION.

Testing Tips

- ☐ Engine should be at normal operating temperature before testing.
- ☐ Manifold vacuum can be monitored from any vacuum source that is located between the throttle valve and the intake valve. The best connection is as close to the throttle valve as possible.
- ☐ If the gauge is connected to a carburetor, be aware that there are three different types of vacuum present at carburetor connections.
 1. Manifold vacuum - High at idle and decreases as throttle is opened.
 2. Ported vacuum - Not present at idle, highest at part throttle and then decreases as throttle is opened further.
 3. Venturi vacuum - Not present at idle, increases as throttle is opened. Typically not more than 3 in. Hg. at its highest.
- ☐ Remember to compensate for altitude when comparing vacuum readings to specifications. The altitude of your location can usually be obtained from a local airport.

Cranking Vacuum Test

This test is used to determine if the engine can create enough vacuum at cranking speed to draw fuel and air into the cylinder so that the engine will start and run. This test is usually performed on engines that have trouble starting. Read, understand and follow Safety Information in the front of this manual.

- ✓ Engine should be at normal operating temperature. If the engine is cold and cannot be started, vacuum readings will be lower than normal.
1. Set the gear selector in neutral for a standard transmission or park for an automatic transmission. Set the parking brake. If the vehicle has an automatic parking brake release, disconnect the release mechanism for testing and reconnect when testing is complete.
 2. Disable the ignition to prevent the engine from starting.

Disabling The Ignition System

- ☐ Turn the ignition switch to the "OFF" position and use a remote starter switch to crank the engine.

Remote Coil

Disconnect the coil wire from the distributor cap.
Ground the coil wire.

Integral Coil Distributor

Disconnect the primary and trigger wire harness from the distributor.

Distributorless Ignition

Disconnect the power supply/trigger wire harness from the ignition control module.

- ✓ If none of these methods can be used to disable the ignition system, ground each spark plug wire to the engine with a short jumper wire.

3. Connect the vacuum gauge hose to an intake manifold vacuum source.
4. If the engine is equipped with electric/electronic idle control devices (idle stop solenoid, idle speed control motor, idle air control, etc.), these devices should be deactivated or positioned so that the throttle blades are fully closed and bypass air is at a minimum.
5. Pinch the PCV hose closed or install a plug in place of the PCV valve to prevent vacuum loss.
6. Crank the engine and observe the vacuum reading. Also, listen to the engine during cranking for speed and unevenness.

- ✓ The battery should be in good condition and fully charged for this test.

7. When cranking test is complete, make all connections and adjustments required to return the engine to normal operating status.

- ☐ Experience is the best guide for determining the "normal" cranking vacuum for the various types of engines. Some mechanically sound engines may produce as little as 3 in. Hg. cranking vacuum, while other engine types will produce 12 to 14 in. Hg.. What is important is that the vacuum reading is average for engine being tested, and that proficiency in determining this increases with experience.

Cranking Vacuum Test Interpretation

Steady Reading (slight pulsation normal)

- Indicates that engine is mechanically sound.

Fluctuating, Pulsating Reading

- Indicates one or more cylinders are not producing as much vacuum as the others. This could be caused by defective pistons, valves, rings or gaskets.

Low Reading (slight pulsation normal)

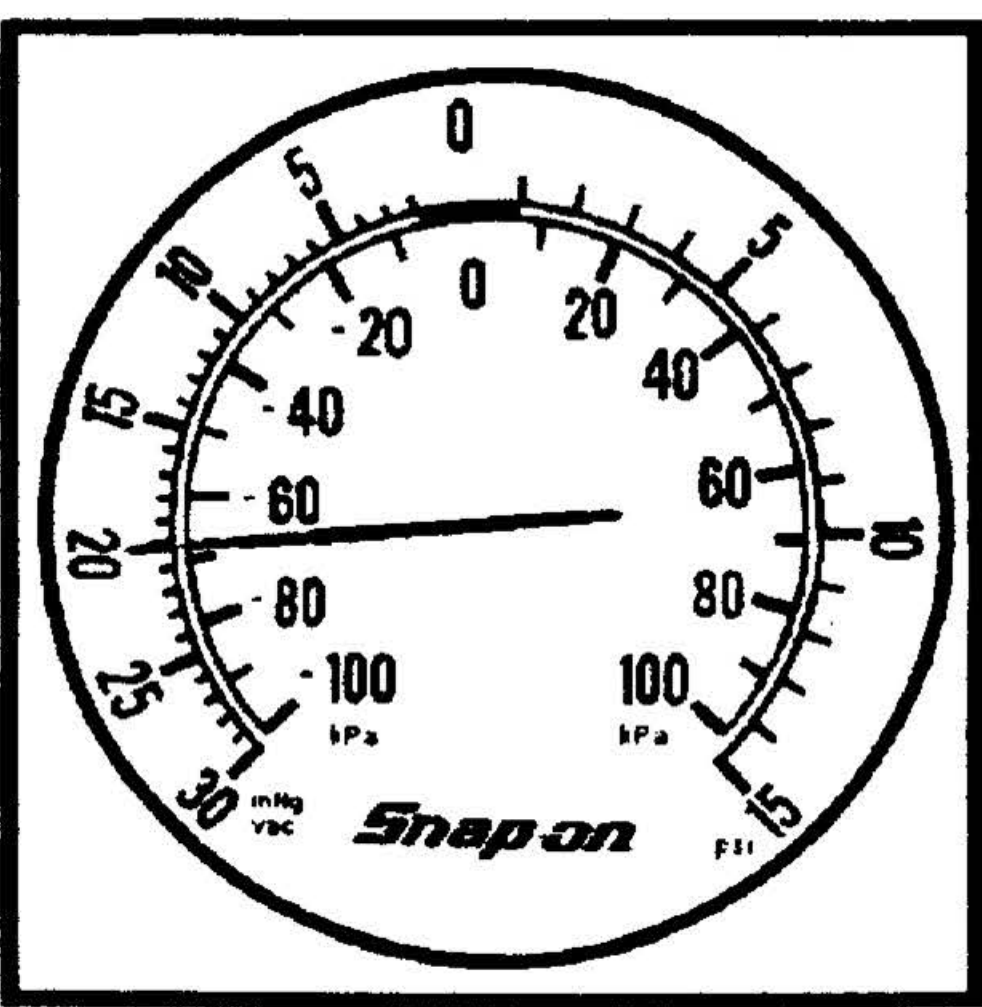
- Indicates an engine that is mechanically inefficient due to leak in intake manifold or vacuum hose or accessory, or incorrect valve timing.

Idle Vacuum Test

✓ Engine should be at normal operating temperature. If the engine is cold, vacuum readings will be lower than normal.

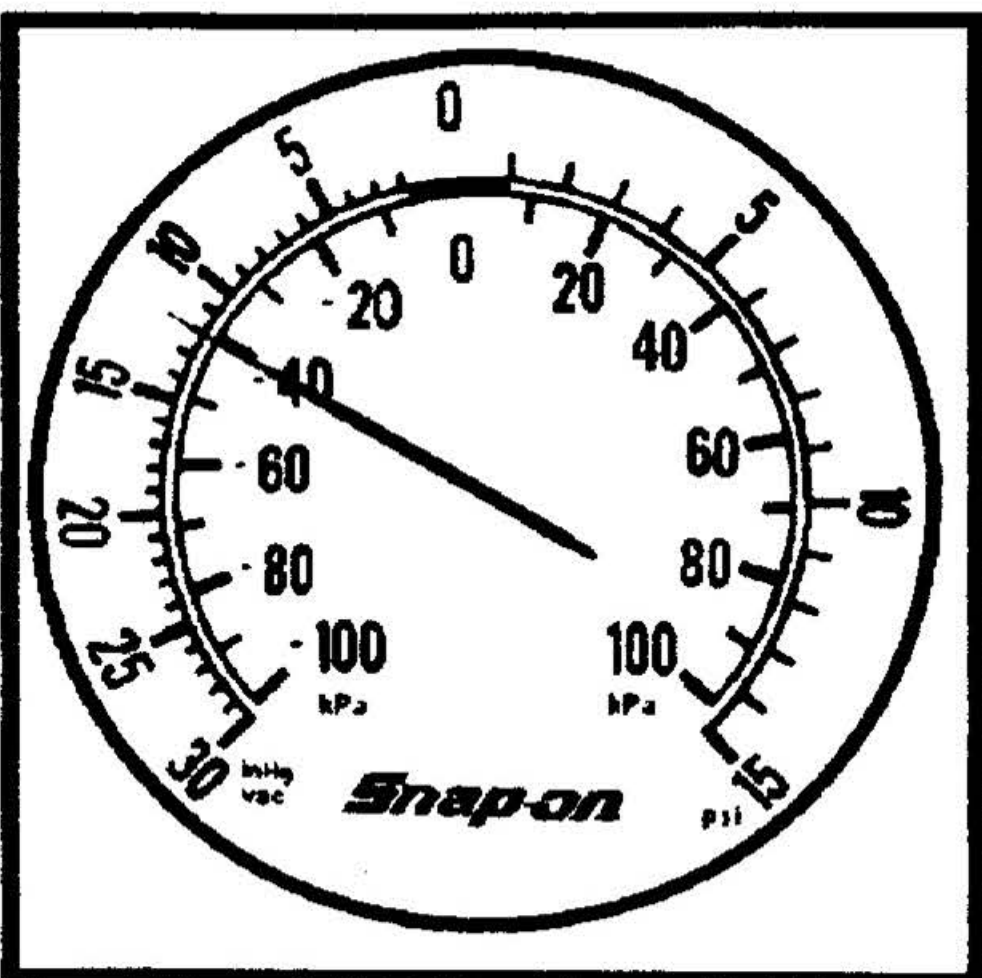
1. Set the gear selector in neutral for a standard transmission or park for an automatic transmission. Set the parking brake. If the vehicle has an automatic parking brake release, disconnect the release mechanism for testing and reconnect when testing is complete.
2. Connect the vacuum gauge hose to an intake manifold vacuum source. Select a source that is closest to the carburetor or throttle body.
3. Observe the vacuum readings with the engine at normal idle speed. Compare the reading to the following list or to the separate chart.

Idle Vacuum Test Interpretation



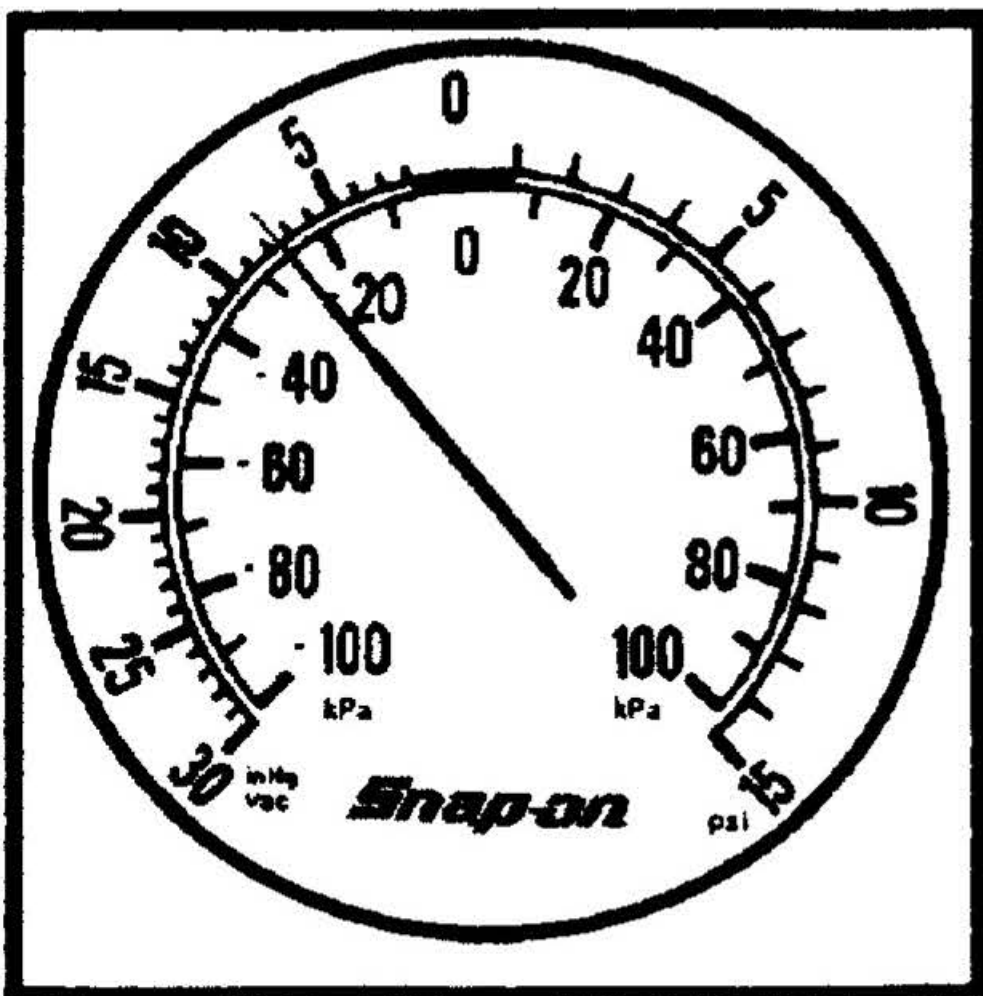
Gauge Reading: Needle steady and within 17 to 22 in. Hg. range.

Indication: Normal engine in good condition.



Gauge Reading: Needle steady and within 10 to 15 in. Hg. range.

Indication: Late ignition timing, late valve timing, low compression (piston rings) or vacuum leak.

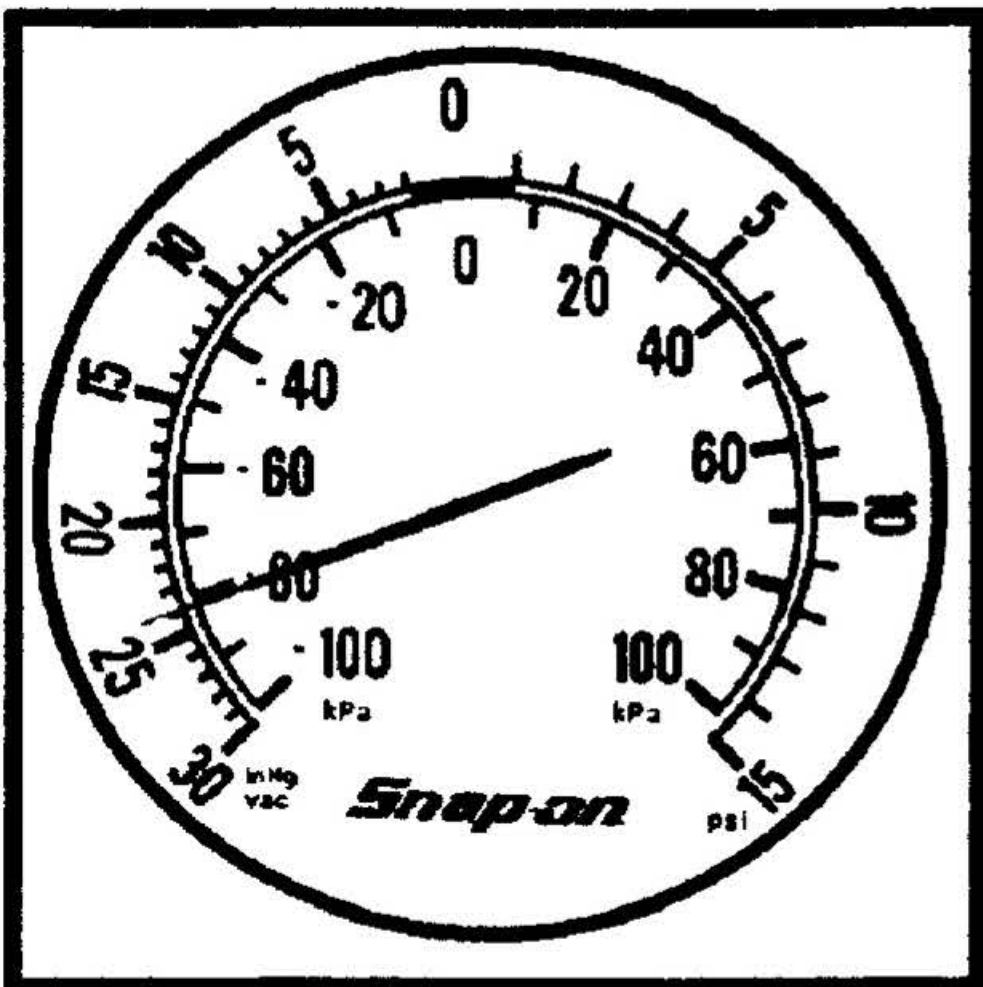


Gauge Reading: Needle steady but very low, less than 10 in. Hg..

Indication: Major vacuum leak, PCV valve stuck open or defective brake booster.

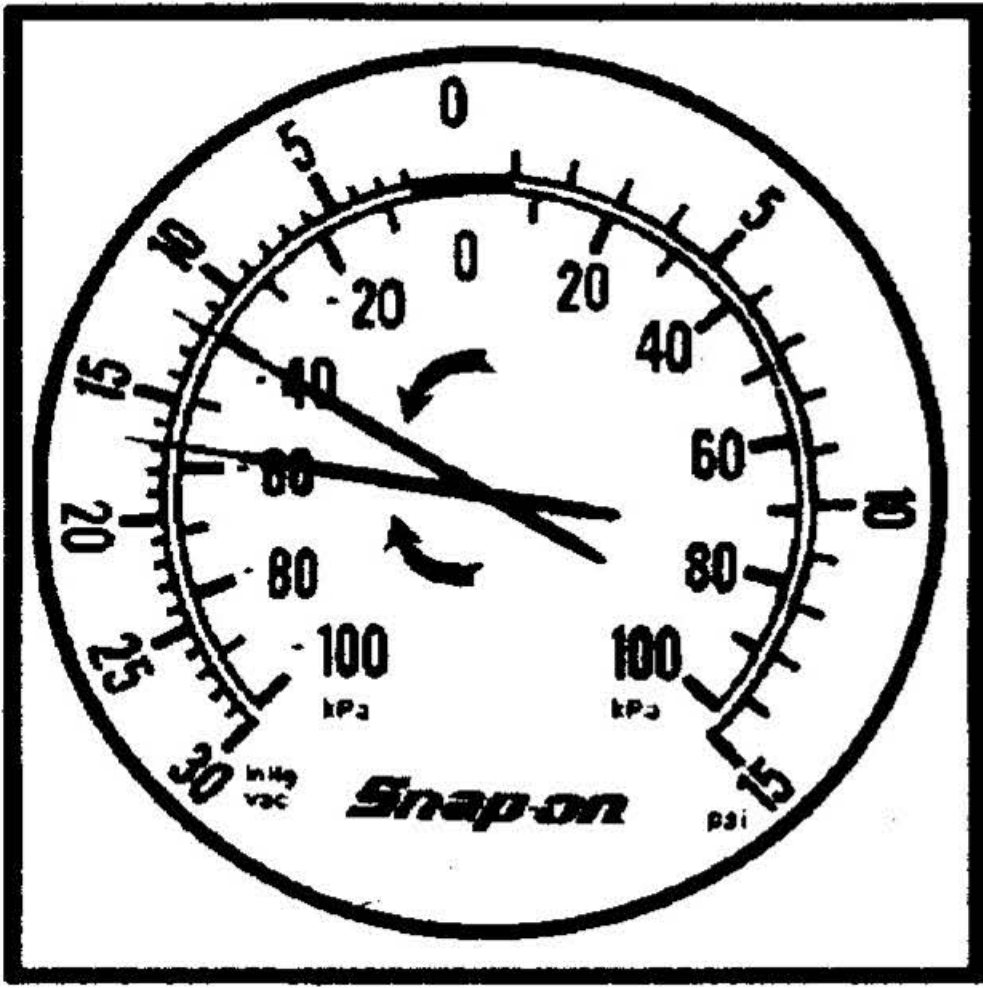


It may be normal for engines with high performance camshafts to have less than 10 in. Hg. at idle.



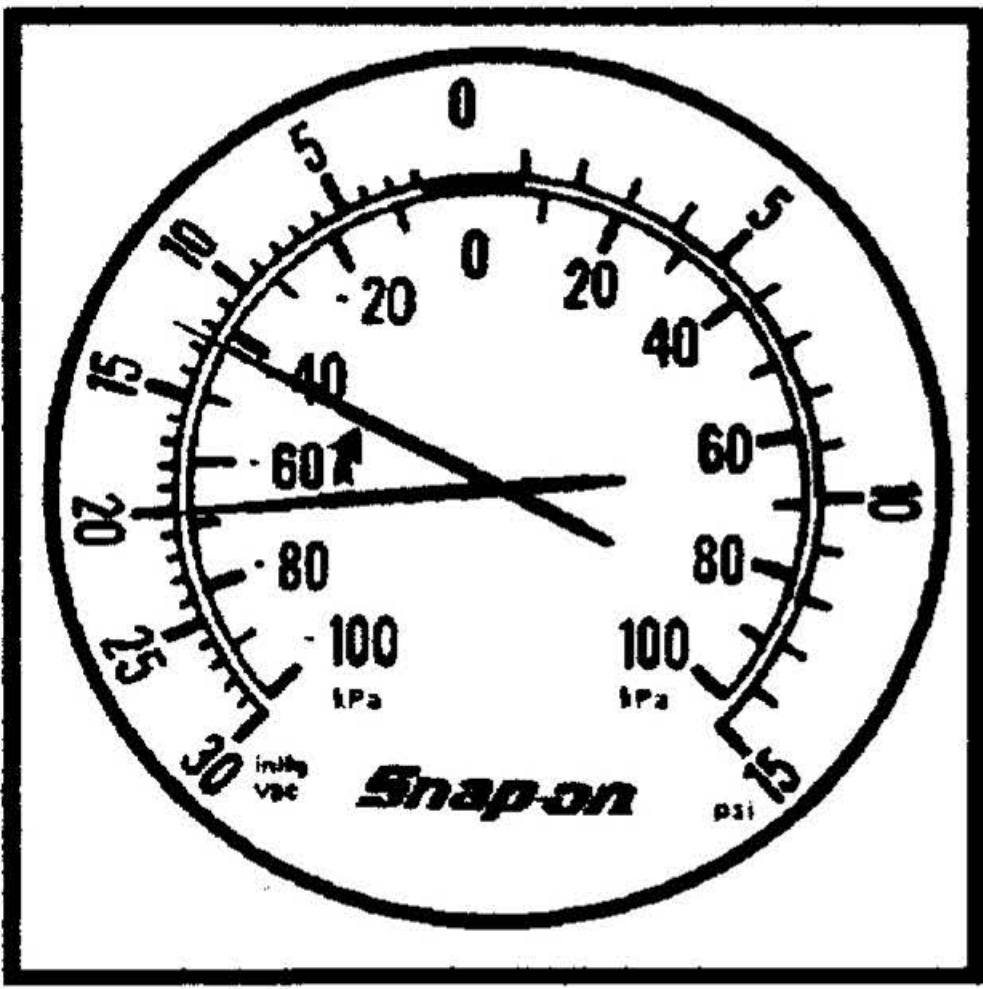
Gauge Reading: Needle steady and higher than 22 in. Hg..

Indication: Ignition timing too far advanced.



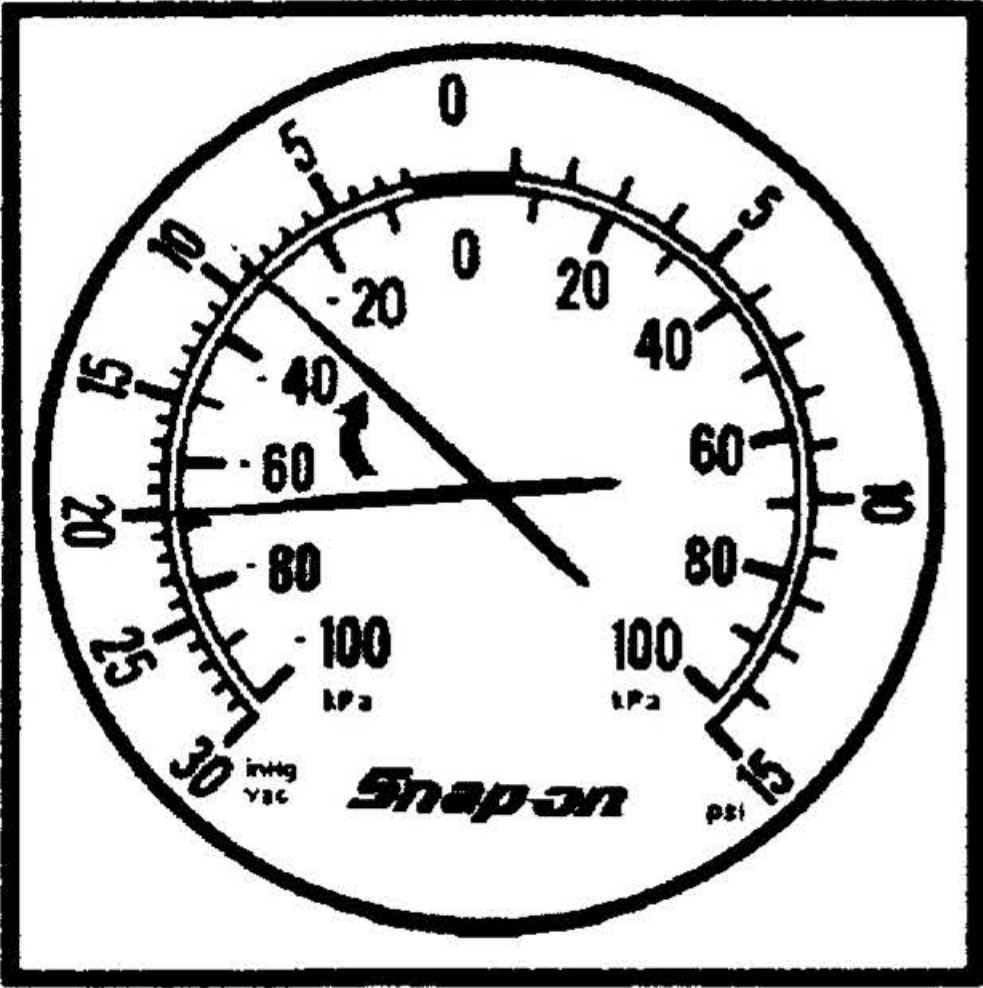
Gauge Reading: Needle drifts back and forth about 4 to 5 in. Hg.

Indication: Improper air fuel mixture or minor vacuum leak.



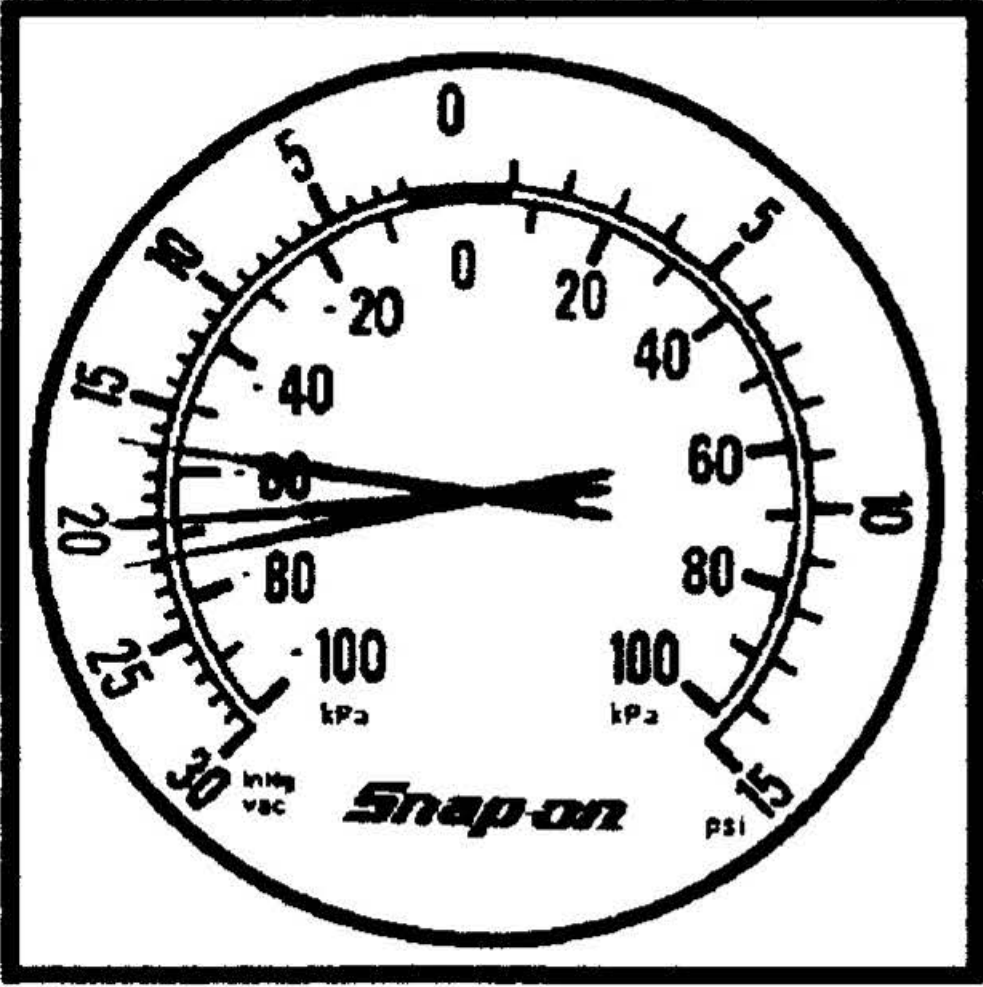
Gauge Reading: Needle steady with intermittent fluctuations.

Indication: Sticking valves or ignition misfire.



Gauge Reading: Needle steady but drops at regular intervals.

Indication: One burnt valve or faulty valve clearance. Needle drops when faulty valve operates.

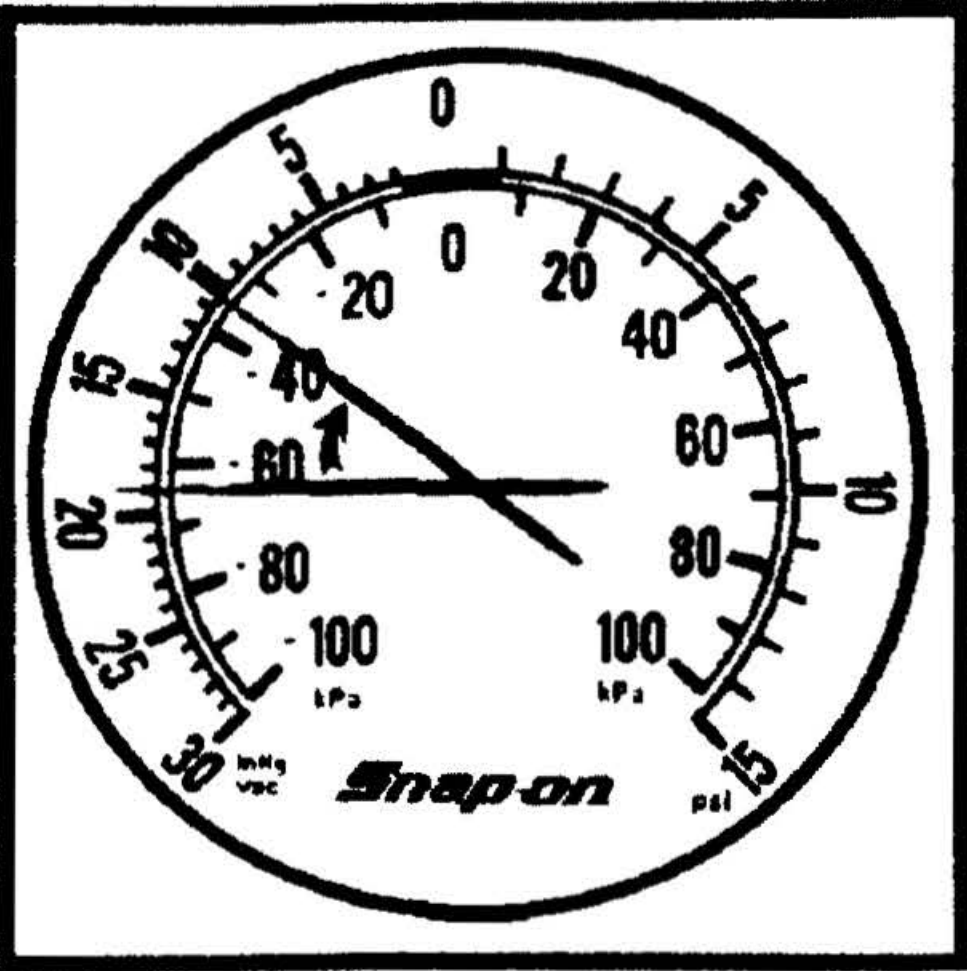


Gauge Reading: Needle reading in normal range, but fluctuates 1 to 5 in. Hg..

Indication: Ignition system problems or worn valve guides.

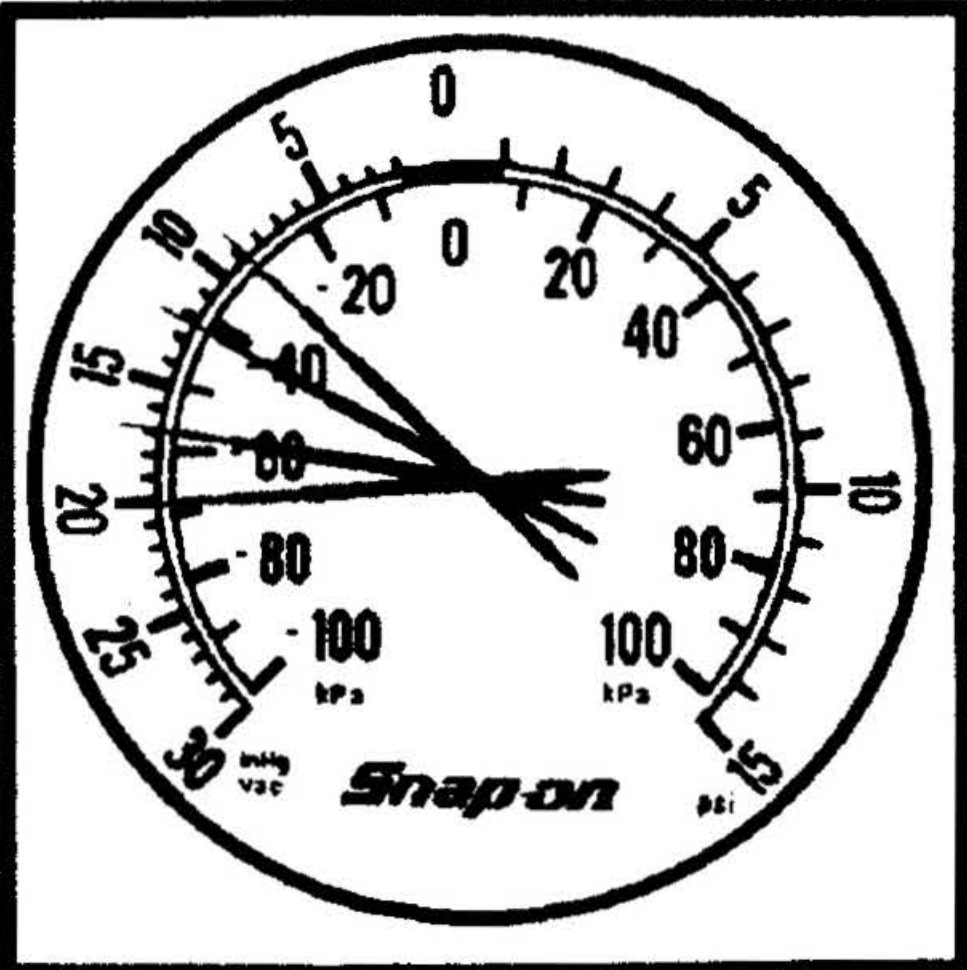


Worn valve guides tend to steady the reading with increased engine speed.



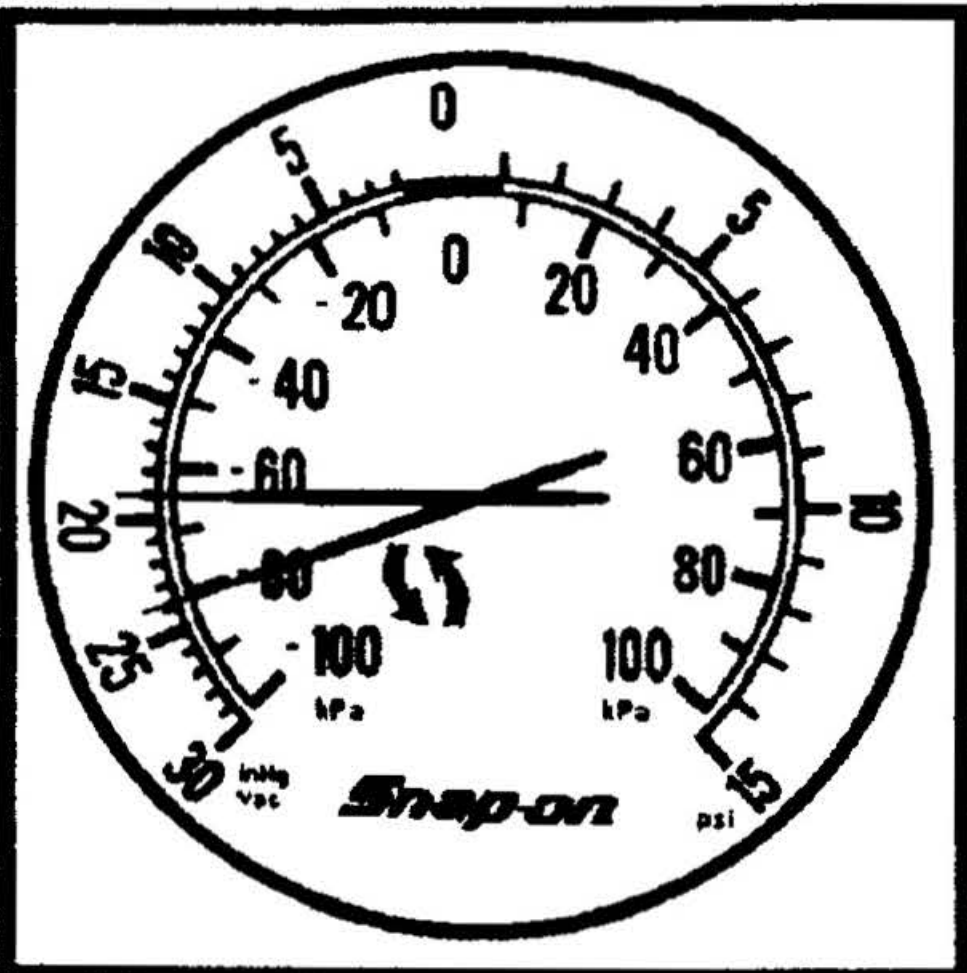
Gauge Reading: Needle steady but reading gradually drops as engine runs.

Indication: Excessive exhaust system back pressure.



Gauge Reading: Needle fluctuates as engine speed increases.

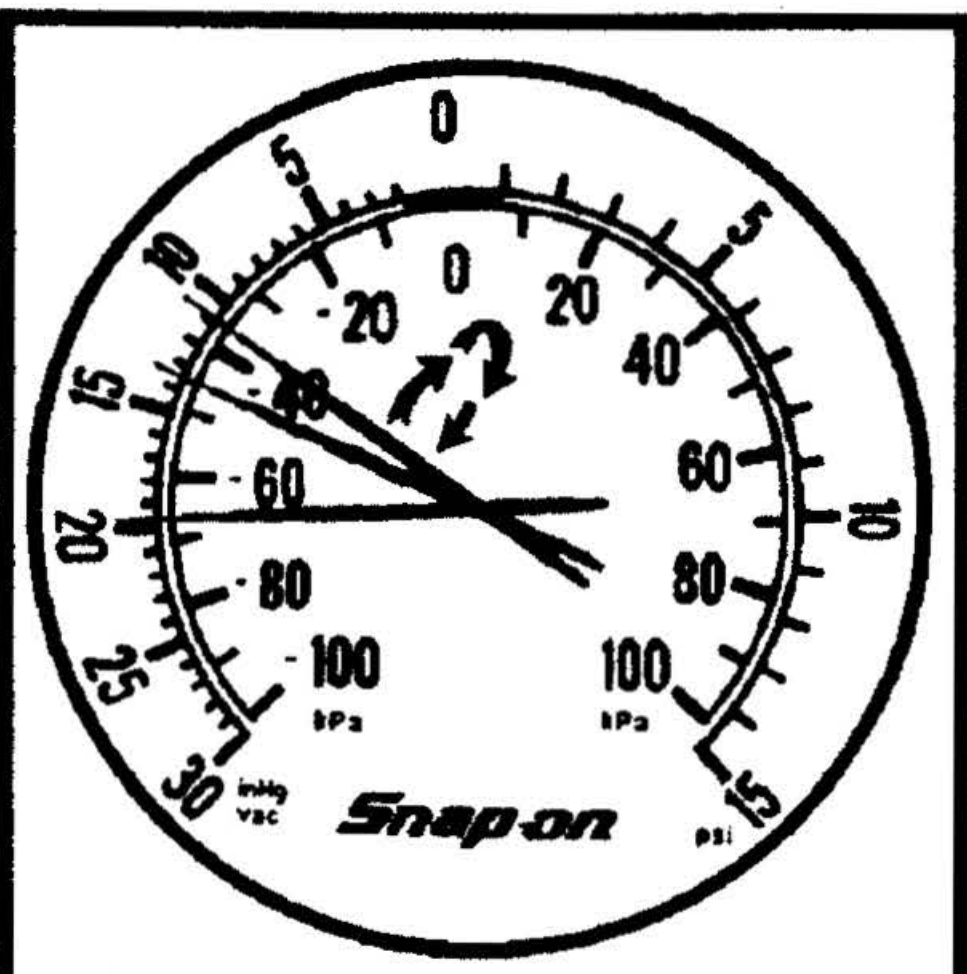
Indication: Ignition misfire.
Leaking valve.
Weak valve spring.
Cylinder head gasket leak.



Procedure: Connect gauge to intake manifold, from idle, slowly increase to 2000 rpm, then quickly close throttle.

Gauge Reading: Increases with engine speed and decreases at the same rate when throttle is closed.

Indication: Normal



Procedure: Connect gauge to intake manifold, from idle, slowly increase to 2000 rpm, then quickly close throttle.

Gauge Reading: Decreases as rpm increases with a slow or jerky return when throttle is closed.

Indication: Excessive exhaust back pressure.

Exhaust Pressure

The exhaust system on a vehicle takes burnt gasses from the engine cylinders and directs it through a catalytic converter (newer cars), through a muffler and pipes with numerous bends and discharges these gasses at the rear of the vehicle. Gasses must pass through the system with a minimum of restriction so that the engine can effectively rid itself of burnt gasses. If the exhaust system is restricted, more and more of the exhaust remains in the engine and reduces the engine efficiency.

Exhaust Back Pressure Test

This test outlines general procedures for performing an exhaust back pressure test. Always consult the manufacturer's repair manual or other technically accurate source for specific procedures and test results for the specific vehicle being tested.

⚠ WARNING

Risk of poisoning

- **Exhaust gas contains deadly poison. Test vehicle in well ventilated areas or route exhaust out-of-doors.**

Poisoning can result in serious injury.



Do not use power exhaust evacuation for this test as it can create inaccurate results.

Test For Vehicles With Oxygen Or Lambda Sensors.

1. Disconnect the electrical connector from the oxygen sensor.
2. Carefully remove the oxygen sensor.
 - ✓ Be careful not to get burned when removing or installing oxygen sensor or back pressure adaptor. They can get very hot.
 - ✓ Sensor may be difficult to remove when engine temperature is below 48° C (120° F). Avoid using excessive force as this may damage the threads in the manifold or exhaust pipe.
3. Install adaptor in place of the oxygen sensor. Tighten to 15 lb. Ft.. Connect hose and gauge to adaptor.
4. Disable the air injection system, if equipped. The system should be prevented from admitting air into the exhaust ports or manifolds.
5. With engine at normal operating temperature, run the engine at 2500 rpm and observe gauge reading. Compare gauge reading to test specification. ***Refer to Test Interpretation in this chapter.***
6. Turn engine off and allow to cool. Disconnect gauge and hose assembly from adaptor and carefully remove adaptor from manifold or exhaust pipe.
7. Apply manufacturer's recommended anti-seize compound to oxygen sensor threads, install sensor and torque to proper value.
8. Reconnect the electrical connector to the oxygen sensor.

Test For Vehicles Without Oxygen Sensors.

Vehicles without oxygen sensors or vehicles that have difficult to access sensors can be tested for exhaust back pressure using **Snap-on** tool THX389.

1. Use the punch with a pneumatic air hammer to create an access hole in the exhaust pipe.
2. Use the self-tapping bolt to thread the hole for the hose adaptor fitting.
3. With the engine at normal operating temperature, run the engine at 2500 rpm and observe the gauge reading. Compare gauge reading to test specification. **Refer to Test Interpretation in this chapter.**
4. Turn off engine and allow to cool.
5. Disconnect gauge and hose from the adaptor. Remove adaptor from the exhaust pipe and install the self-tapping bolt to permanently seal the test access point.

Exhaust Pressure Test Interpretation

Always consult the manufacturer's repair manual or other technically accurate source for specific procedures and test results for the specific vehicle being tested.

Less than 2.5 psi (17.2 kPa): Unrestricted exhaust

More than 2.5 psi (17.2 kPa): Excessive exhaust back pressure.

Inspect the entire exhaust system for:

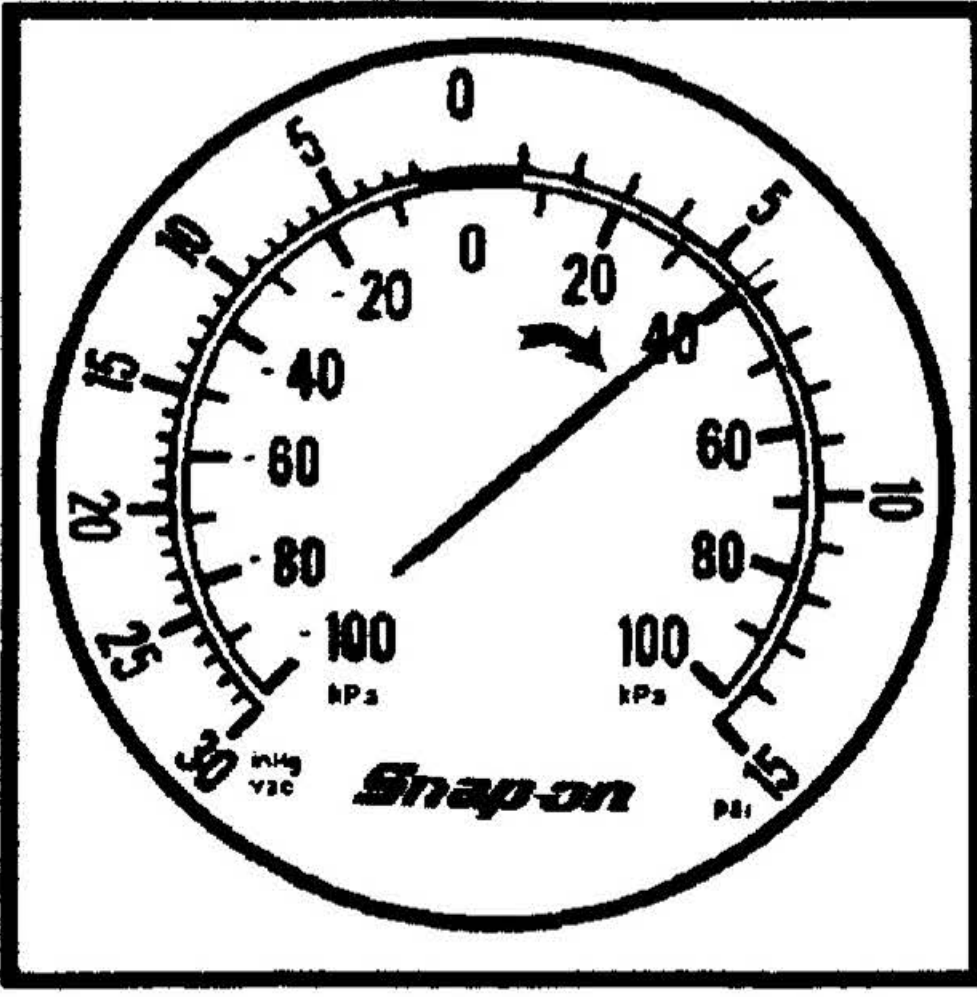
Damaged or collapsed pipes,
Internal muffler failure, or
Restricted catalytic converter.



If the catalytic converter is found to be restricted, determine and correct the cause to avoid repeat failures.

Common causes are:

Rich operation due to misfire or fuel system control problems,
Contamination from leaded fuels,
Faulty air injection system, or
Leaking gaskets or engine mechanical problems allowing engine oil or coolant into the exhaust system where it plugs up the catalytic converter.



Procedure: Connect gauge to exhaust, with engine at normal temperature run at 2500 rpm.

Gauge Reading: Less than 2.5 psi is good, more than 2.5 psi is bad.

Indication: More than 2.5 psi is excessive exhaust back pressure.

Additional Tests

Testing MAP (Manifold Absolute Pressure) Sensors

This test is used to determine if a vehicles' engine control computer is receiving accurate vacuum or pressure readings from the sensor. For this test, the vacuum gauge needs to be used with a scan tool or a digital multimeter.

1. Use a "T" connection to connect the vacuum gauge into the MAP sensor line.
2. Connect the appropriate scan tool to the vehicle, or connect a digital multimeter to the MAP sensor output terminals.
3. Run the engine and compare vacuum gauge readings to the values displayed on the scan tool or multimeter.
4. The gauge reading should be very close to the same value displayed on the scan tool or multimeter. If the values are different, the MAP sensor may be faulty (out of range) or the wiring may have excessive resistance between the sensor and computer or the computer may be improperly processing the information.

Supercharged and Turbocharged Engines

The vacuum/pressure gauge can be used to measure manifold boost pressure on supercharged or turbocharged engines. Attach the gauge and hose to the intake manifold the same as for vacuum testing. be aware that boost pressure will only be present at higher engine speeds. A road test may be required to develop boost pressure.

Testing Vacuum Operated Accessories

Snap-on vacuum/pressure gauges and adaptors offer an efficient and effective way to trouble shoot a vehicles vacuum operated systems. The gauge, connected to the accessory end of a vacuum line, can be used to make sure that the proper amount of vacuum is supplied to the accessory item. The gauge can be tapped into a vacuum system with a "T" fitting. This allows the system vacuum to be monitored while the accessory is operating. A vehicle can be road tested with the gauge tapped into a system to monitor for malfunctions that only occur during driving conditions.

Typical vacuum devices that may be tested are:

Vacuum actuators or diaphragms:

- Air cleaner door motor,
- Heater door control actuator, or
- Distributor vacuum advance unit.

Solenoid operated vacuum valves:

- EGR, AIR switching and divert valves, or
- Canister purge valves.

Thermostatic vacuum switches:

- 2, 3 or 4 port vacuum control valves.

Vacuum delay valves or vacuum vent valves:

These vacuum components may be operated by manifold vacuum, ported vacuum, venturi vacuum or various combinations of any of these.

Consult a manufacturer's manual or other reliable source for vacuum specifications and test procedures when performing vacuum tests.

Maintenance

Keep your vacuum/pressure gauge clean by wiping it off with a soft cloth after each use. Do not use harsh cleaners or solvents to clean with as they may cloud or discolor the plastic lens.

If the gauge does not seem to be working properly, check to make sure that the hose or adaptor has not become restricted by grease or debris.

Parts List

Gauge and Boot Assembly.....	EAA0192L23A
Gauge.....	8-2620
Boot.....	EAC0039K19A
Replacement Lens.....	EAC0039K17A
Silicon Hose (4 ft).....	5-3735-480
3/16 Adaptor.....	EAC0023L13A
1/4 Adaptor.....	EAC0023L14A
5/16 Adaptor.....	EAC0023L15A
3/8 Adaptor.....	EAC0023L16A
Universal Male Adaptor.....	MT14-11
Oxygen Sensor Adaptor M18-1.5.....	EAA0195L08A
Oxygen Sensor Adaptor Plate.....	1-2684
Oxygen Sensor Adaptor Gasket.....	8-1151
Storage Case.....	PB-140

Optional Accessories

Testing Mechanical Fuel Pumps

“T” Hose Manifold.....	MT311G-10A
------------------------	------------

Testing Diesel Injection Cold Advance

7/16 x 20 Adaptor.....	MT311G-40
5/16 x 24 Adaptor.....	MT14-18
1/4 x 28 Adaptor.....	MT14-17

See your **Snap-on** representative for additional adaptors not listed here.

Notes:

Notes:

Snap-on Vacuum/Pressure Gauge Set
Limited One (1) Year Warranty

SNAP-ON TOOLS COMPANY WARRANTS THIS VACUUM/PRESSURE GAUGE SET TO BE FREE FROM DEFECTS IN WORKMANSHIP AND MATERIALS FOR ONE (1) YEAR FROM THE DATE OF PURCHASE BY THE ORIGINAL CONSUMER. **Snap-on** will repair or replace this tester if it fails to give satisfactory service due to defective workmanship or materials. Repair or replacement shall be at the election and expense of **Snap-on** Tools Company. Products must be returned to **Snap-on** or a **Snap-on** dealer for warranty service, unless such return is unreasonable. Proof of purchase date is required to make a warranty claim.

Snap-on does NOT provide any warranty for 1) products labeled other than **Snap-on** 2) consumable products (except as noted below) or 3) products subjected to abnormal use. The warranty for non **Snap-on** products is provided by the manufacturer, which is not **Snap-on**. **Snap-on** will pass on warranties granted by other manufacturers. Consumable products are not covered by any warranty, except for a defect in workmanship or materials in a new product that prevents its use. Consumable products are goods reasonably expected to be used up or damaged during use, including but not limited to drill bits, saw blades, grinding discs, sanding discs, knife blades, files, O₂ sensors and batteries. Abnormal use includes misuse, accident, modification, unreasonable use, neglect, lack of maintenance, use in production-related service, or use after the tool is significantly worn.

SNAP-ON SHALL NOT BE LIABLE FOR ANY INCIDENTAL, SPECIAL OR CONSEQUENTIAL COSTS OR DAMAGES INCURRED BY THE PURCHASER OR OTHERS (including without limitation, lost profits, revenues, anticipated sales, business opportunities, goodwill, or interruption of business and any other injury or damage). Some states do not allow the exclusion or limitations of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty is your exclusive remedy and is in place of all other rights and remedies. You may have other rights which vary from state to state or country.

For further information contact:
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Kenosha, WI 53141-1410

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